

Department of Commerce

Safety & Buildings Division

201 West Washington Avenue

P.O. Box 2658

Madison, WI 53701-2658

Evaluation #	200231-M (Replaces 200115-M)
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Wisconsin Building Products Evaluation

Material

Pre-Engineered Metal Building Systems
(**Trade Names:** Metallic Building Company &
Mid-West Steel Building Company)

Manufacturer

N.C.I. Building Systems, L. P.
7301 Fairview
Houston, TX 77041

SCOPE OF EVALUATION

GENERAL: This report evaluates the use of the Pre-Engineered Metal Building Systems manufactured by N.C.I. Building Systems, L.P. (Gable Symmetrical and Unsymmetrical, Single-Slope and Lean-To Framed), through a review of structural performance.

This review includes the cited **Comm** code requirements below in accordance with the current **Wisconsin Building and Heating, Ventilating and Air conditioning Code:**

- **Structural:** The Gable Symmetrical and Unsymmetrical, Single-Slope and Lean-To Framed systems were evaluated in accordance with ss. **Comm 53.10, 53.11, 53.12, 53.16, 53.50, 53.51, and 53.53.**

[illegible]

This review includes the cited **International Building Code (IBC)** requirements below in accordance with the **Wisconsin Amended IBC Code (effective 7/01/02)**:

- **Structural:** The Gable Symmetrical and Unsymmetrical, Single-Slope and Lean-To Framed systems were evaluated in accordance with ss. **IBC 1603.1, 1604.1, 1604.2, 1604.3.1, 1604.3.3, 1604.4, 1604.5, 1605.1, 1606 through 1609, 2208.1 [Comm 62.2208], 2209.1, 2209.2 and 2211.5.**

[illegible]

DESCRIPTION AND USE

General: The N.C.I. pre-engineered metal building systems include gable symmetrical and unsymmetrical, single-slope and lean-to framing. The structures may have straight, or tapered columns, varying roof pitches and interior columns symmetrically or unsymmetrical placed, flush or by-pass girts

and purlins, simple span or continuous design. They are structures of varying widths, lengths and bay spacing. Connections are field bolted. Wind bracing cable-rods, angles or portal frames are used. Endwalls are cold-form, built-up, or hot rolled. Covering and cold-formed section sizes are covered in the section properties and specifications. All materials designed per the current edition of AISI or AISC.

Gabled symmetrical buildings have a ridge at the center line and can have straight columns, or tapered columns, with flush or by-pass girt conditions. They have interior columns of varying numbers symmetrically or unsymmetrical placed with roof slopes from 1/2:12 to 12:12 pitch.

Gabled unsymmetrical buildings have a ridge off set from the center of the building. These buildings may have straight or tapered columns with flush or by-pass girt conditions. They may have interior columns of varying numbers symmetrically or unsymmetrical placed with roof slopes from 1/4:12 to 12:12 pitch. Slopes can be the same on both sides giving two different eave heights or different slopes giving the same eave height.

Single slope framing is a single slope frame with straight or tapered columns, with flush or by-pass girt conditions. They have interior columns of varying numbers symmetrically or unsymmetrical placed with roof slopes from 1/4:12 to 12:12 pitches.

Lean-to framing is a single slope frame with no high side column, the high side being supported by another structure. This frame may have straight or tapered columns, with flush or by-pass girt conditions. They may have interior columns of varying numbers symmetrically or unsymmetrical placed with roof slopes from 1/4:12 to 12:12 pitches.

Basic building sizes vary but stay within these parameters:

Spans: 10'-500'

Eave Heights: 8'- 40'

Roof slope: 1/4:12 to 12:12

Live Load: 30 PSF & 40 PSF '

Ground Snow: 30 PSF to 60 PSF

Roof Snow: $30 \times 0.7 = 21$ psf to $60 \times 0.7 = 42$ psf

Wind Load: 90 mph 3-second gust, exp. B or C

Collateral Load: 3 psf (minimum)

Seismic Loads: $S_s = 5.4$ to 14.3 and $S_1 = 1.6$ to 5.4

Frames are braced by girts or purlins to maintain compressive stress within AISC allowable stress limits for any combination of loading, by providing flange braces from the purlin or girt to the inside flange of the frames.

Purlin and girts are designed as continuous or simple span members. They vary from 4" depth to 14" depth and have flange widths from 2.5" to 4", with minimum yield of 57 ksi. Purlin and girt size vary upon the spacing and load of same. End spans are typically of a heavier gauge than the interior spans.

Eave struts are cold-formed unequal leg C-Section or a combination of Z- Sections, that typically have the same depth as the purlins, and designed to carry the loads at the eave of the building.

Endwalls are expandable, non-expandable or bearing frame. Bearing frame rafters are simple span beams or continuous span beams depending on the width of the structure and it's load conditions.

Endwall rafters can be 8" to 12" deep C-Sections with 57 ksi minimum yield, hot rolled sections of 50 ksi yield, or build up members of 50 ksi material. The endwall columns are of similar materials as the rafter, and are analyzed as simple beam columns. The material selected for the rafter and columns are

dependent upon the loads being generated on the rafter or columns being designed, and therefore the endwall may be a combination of the above materials.

Wind bracing consists of cable, rods, angles, or portal frames of varying sizes dependent upon the loads being generated by the wind and earthquake forces on the building.

Roof covering type R, U, PBR, WRII, and WRIII may be 26 to 22 gauge material with fastening and erection per the erection drawings provided with the specific job, or the engineering manual.

Wall covering type R, AM, SHP, and U may 22 to 26 gauge material with fastening and erection per the erection drawings provided with the specific job, or the engineering manual.

Yields of material are provided on the calculations and are typically 50 ksi on the built up main frames and 36-50 ksi on the hot rolled materials. Yields may vary depending on the availability of materials.

Main bolted diagonal, and vertical connections on the primary and the secondary steel utilize high strength steel bolts conforming to the "Specification for Structural Joints Using ASTM A325 or A490 Bolts" approved by The Research Council on Structural Connections of the Engineering Foundation. A307 bolts are used for connections of purlins, girts, and framed openings.

CALCULATIONS

All primary steel, built-up sections are manufactured from 50 psi minimum yield steel, all hot rolled sections from 42 psi minimum yield steel, designed in accordance with current AISI or AISC Specifications, whichever is applicable.

The design and assembly of structural joints and connections (primary and secondary steel) using high strength steel bolts conform to the "Specification for Structural joints Using ASTM A325 and A307 Bolts" approved by the Research Council on Structural Connections of the Engineering Foundation.

All secondary structure is designed in accordance with current AISI or AISC Specifications, whichever is applicable.

All cladding material is designed in accordance with the 1986 edition of the "Specifications for Design of Light Gauge Cold Formed Steel Structural Members"-AISI with 1989 addendum.

TESTS AND RESULTS

The tests and results cover the current WI Building Code requirement: Weld test data satisfying **s. Comm 53.53(10)** of the Wisconsin Building Code has been submitted.

LIMITATIONS OF APPROVAL

The limitations below apply both to the Building Code Applicable to Projects Submitted for Review Prior to July 1, 2002 and the **Wisconsin Amended IBC 2000 Code (effective 7/01/02)**.

The approval number permits plan submittal without repetitious structural calculations. This approval is for uniform loading condition only. Any special concentrated loading condition is not included under this approval number and requires complete structural calculations.

INFORMATION REQUIRED ON PLANS SUBMITTED FOR APPROVAL

